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~~Claims~~

What is claimed is:

1. A cardiac electrical stimulation system having an autocapture stimulation/sensing configuration for use with atrial and ventricular leads, said cardiac electrical stimulation system including:

an atrial lead having atrial electrodes electrically coupled thereto;

a ventricular lead having ventricular electrodes electrically coupled thereto;

a pulse generator enclosed in a housing, said pulse generator electrically coupled to at least one of said atrial electrodes and said ventricular electrodes for providing an electrical stimulus to at least one of an atrium or ventricle of a heart; and

10 a sensing circuit that senses an evoked response by the heart to the electrical stimulus, said sensing circuit electrically coupled to said atrial electrodes and said ventricular electrodes, wherein a signal associated with an evoked response from the electrical stimulus is sensed between at least one of said atrial electrodes and said 15 ventricular electrodes.

2. The cardiac electrical stimulation system as recited in claim 1, wherein said atrial lead includes at least one of an atrial tip electrode and an atrial ring electrode, and said ventricular lead includes at least one of a ventricular tip electrode, a ventricular superior vena cava electrode, a ventricular coil electrode, and a ventricular ring electrode.

20 3. The cardiac electrical stimulation system as recited in claim 2, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and the ventricular ring electrode.

25 4. The cardiac electrical stimulation system as recited in claim 2, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular coil electrode.

5. The cardiac electrical stimulation system as recited in claim 2, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular superior vena cava electrode.
- 5 6. The cardiac electrical stimulation system as recited in claim 2, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the ventricular coil electrode.
- 10 7. The cardiac electrical stimulation system as recited in claim 2, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the ventricular superior vena cava electrode.
- 15 8. The cardiac electrical stimulation system as recited in claim 2, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular tip electrode.
9. The cardiac electrical stimulation system as recited in claim 2, wherein the electrical stimulus conducts electrically between the atrial tip electrode and the housing.
- 20 10. The cardiac electrical stimulation system as recited in claim 2, wherein the electrical stimulus conducts electrically between the ventricular tip electrode and the housing.

11. A cardiac electrical stimulation system having an autocapture stimulation/sensing configuration for use with atrial and ventricular stimulation and sensing leads, said cardiac electrical stimulation system including:

- an atrial lead having atrial electrodes electrically coupled thereto;
- 5 a ventricular lead having ventricular electrodes electrically coupled thereto;
- a stimulation means for providing an electrical stimulus to at least one of an atrium or ventricle of a heart, said stimulation means enclosed in a housing and electrically coupled to at least one of said atrial electrodes and said ventricular electrodes; and
- X 10 a sensing means for sensing an evoked response by the heart to the electrical stimulus, said sensing circuit electrically coupled to said atrial electrodes and said ventricular electrodes, wherein a signal associated with an evoked response from the electrical stimulus is sensed between at least one of said atrial electrodes and said ventricular electrodes.

15 12. The cardiac electrical stimulation system as recited in claim 11, wherein said atrial lead includes at least one of an atrial tip electrode and an atrial ring electrode, and said ventricular lead includes at least one of a ventricular tip electrode and a ventricular ring electrode.

20 13. The cardiac electrical stimulation system as recited in claim 12, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and one of said ventricular electrodes.

25 14. The cardiac electrical stimulation system as recited in claim 12, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and one of said ventricular electrodes.

15. The cardiac electrical stimulation system as recited in claim 12, wherein the electrical stimulus conducts electrically between the atrial tip electrode and the housing.

16. The cardiac electrical stimulation system as recited in claim 12, wherein the electrical stimulus conducts electrically between the ventricular tip electrode and the housing.

5 17. A cardiac electrical stimulation system having a atrial autocapture sensing configuration, comprising:

an atrial lead having atrial electrodes electrically coupled thereto, wherein said atrial lead includes a ventricular tip electrode;

a ventricular lead having ventricular electrodes electrically coupled thereto;

10 a pulse generator enclosed in a housing, said pulse generator electrically coupled to said atrial electrode for providing an electrical stimulus to an atrium; and

 a sensing circuit that senses an evoked response by the heart to the electrical stimulus, said sensing circuit electrically coupled to said atrial electrodes and said ventricular electrodes, wherein a signal associated with an evoked response from the electrical stimulus is sensed between at least one of said atrial electrodes and said ventricular electrodes.

15 18. The cardiac electrical stimulation system as recited in claim 17, wherein said atrial lead includes at least one of an atrial ring electrode and an atrial tip electrode and said ventricular lead includes at least one of an superior vena cava electrode, a ventricular coil electrode, a ventricular ring electrode and a ventricular tip electrode.

20 19. The cardiac electrical stimulation system as recited in claim 18, wherein the signal associated with the evoked response is sensed between one of atrial ring electrode to ventricular ring electrode, atrial ring electrode to can electrode, atrial ring electrode to ventricle coil electrode, atrial ring electrode to superior vena cava coil electrode, atrial tip electrode to ventricular coil electrode, atrial tip electrode to ventricular tip electrode, atrial tip electrode to atrial ring electrode, superior vena cava coil electrode to atrial tip electrode, superior vena cava coil electrode to ventricular coil electrode, superior vena cava coil electrode to ventricular tip electrode, ventricular tip electrode to ventricular coil electrode, superior vena cava coil electrode to ventricular ring electrode, and ventricular

ring electrode to ventricular coil electrode.

20. The cardiac electrical stimulation system as recited in claim 19, further comprising an afterpotential attenuation means for attenuating afterpotentials which result due to the application of the pacing stimulus to the heart by said cardiac pacing system, said afterpotential attenuation means being electrically coupled to said stimulation means.

21. The cardiac electrical stimulation system as recited in claim 19, further comprising at least one of an indifferent electrode and a can electrode.

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22. The cardiac electrical stimulation system as recited in claim 21, wherein the signal associated with the evoked response is sensed between one of atrial tip electrode to can electrode, atrial tip electrode to indifferent electrode, superior vena cava coil electrode to indifferent electrode, superior vena cava coil electrode to can electrode, ventricular coil electrode to can electrode, ventricular coil electrode to indifferent electrode, ventricular tip electrode to indifferent electrode, ventricular tip electrode to can electrode, and ventricular ring electrode to can electrode.

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23. The cardiac electrical stimulation system as recited in claim 22, further including an afterpotential attenuation means for attenuating afterpotentials which result due to the application of the pacing stimulus to the heart by said cardiac pacing system, said afterpotential attenuation means being electrically coupled to said stimulation means.

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24. A cardiac electrical stimulation system having a ventricular autocapture stimulation/sensing configuration for use with atrial and ventricular leads, said cardiac electrical stimulation system including:

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an atrial lead having atrial electrodes electrically coupled thereto;

a ventricular lead having ventricular electrodes electrically coupled thereto,

wherein said ventricular lead includes a ventricular tip electrode;

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a stimulation circuit for providing an electrical stimulus to a ventricle of a heart, said stimulation means enclosed in a housing, wherein the electrical stimulus conducts

electrically between the ventricular tip electrode and the housing; and

a sensing circuit for sensing an evoked response by the heart to the electrical stimulus to the ventricle, wherein a signal associated with an evoked response from the electrical stimulus to the ventricle is sensed between at least one of said atrial electrodes and said ventricular electrodes.

5 25. The cardiac electrical stimulation system as recited in claim 24, wherein said atrial lead includes at least one of an atrial ring electrode and an atrial tip electrode and said ventricular lead includes at least one of an superior vena cava electrode, a ventricular coil electrode, a ventricular ring electrode and a ventricular tip electrode.

10 26. The cardiac electrical stimulation system as recited in claim 25, wherein the signal associated with the evoked response is sensed between one of atrial ring electrode to ventricular ring electrode, atrial ring electrode to can electrode, atrial ring electrode to ventricle coil electrode, atrial ring electrode to superior vena cava coil electrode, atrial tip electrode to ventricular coil electrode, atrial tip electrode to ventricular tip electrode, atrial tip electrode to atrial ring electrode, superior vena cava coil electrode to atrial tip electrode, superior vena cava coil electrode to ventricular coil electrode, superior vena cava coil electrode to ventricular tip electrode, ventricular tip electrode to ventricular coil electrode, superior vena cava coil electrode to ventricular ring electrode, and ventricular ring electrode to ventricular coil electrode.

15 27. The cardiac electrical stimulation system as recited in claim 26, further including an afterpotential attenuation means for attenuating afterpotentials which result due to the application of the pacing stimulus to the heart by said cardiac pacing system, said afterpotential attenuation means being electrically coupled to said stimulation means.

20 28. The cardiac electrical stimulation system as recited in claim 25, further comprising at least one of an indifferent electrode and a can electrode.

30 29. The cardiac electrical stimulation system as recited in claim 28, wherein the signal

associated with the evoked response is sensed between one of atrial tip electrode to can electrode, atrial tip electrode to indifferent electrode, superior vena cava coil electrode to indifferent electrode, superior vena cava coil electrode to can electrode, ventricular coil electrode to can electrode, ventricular coil electrode to indifferent electrode, ventricular tip electrode to indifferent electrode, ventricular tip electrode to can electrode, and ventricular ring electrode to can electrode.

30. The cardiac electrical stimulation system as recited in claim 29, further including an afterpotential attenuation means for attenuating afterpotentials which result due to the
10 application of the pacing stimulus to the heart by said cardiac pacing system, said afterpotential attenuation means being electrically coupled to said stimulation means.

31. A method of automatically determining whether an electrical stimulus evokes a response in the heart when the stimulus is applied by a cardiac electrical stimulation
15 system having atrial and ventricular leads, a pulse generator, and a sensing circuit, said method comprising the steps of:

providing an electrical stimulus to at least one of an atrium or ventricle of a heart;
and

sensing an evoked response by the heart to the electrical stimulus, wherein a signal
20 associated with an evoked response from the electrical stimulus is sensed between at least one of an atrial electrode and a ventricular electrode of said leads.

32. The method as recited in claim 31, wherein said atrial lead includes at least one of an atrial tip electrode and an atrial ring electrode, and said ventricular lead includes at least
25 one of a ventricular tip electrode, a ventricular superior vena cava electrode, a ventricular coil electrode, and a ventricular ring electrode.

33. The method as recited in claim 32, wherein the electrical stimulus conducts electrically between the atrial tip electrode and the housing.

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34. The method as recited in claim 32, wherein the electrical stimulus conducts

electrically between the ventricular tip electrode and the housing.

35. The method as recited in claim 32, wherein the signal associated with the evoked response is sensed between the atrial tip electrode and the ventricular ring electrode.

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36. The method as recited in claim 32, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular coil electrode.

37. The method as recited in claim 32, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular superior vena cava electrode.

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38. The method as recited in claim 32, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the ventricular coil electrode.

39. The method as recited in claim 32, wherein the signal associated with the evoked response is sensed between the ventricular ring electrode and the ventricular superior vena cava electrode.

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40. The method as recited in claim 32, wherein the signal associated with the evoked response is sensed between the atrial ring electrode and the ventricular tip electrode.

41. The method as recited in claim 31, further comprising the step of attenuating the afterpotential.

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